

# DVI-100

## User Guide



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# 1 Introduction

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## 1.1 Overview

This document contains information about installation, settings, and operation of the DVI-100 TETRA Radio Modem. Additional information is also available over the Internet, at the website [www.TetraModem.com](http://www.TetraModem.com), in the FAQ pages. This includes practical guidance relating to antenna selection and installation, operating range, extension modules, software support, etc.

## 1.2 Safety Precautions

This equipment transmits radio waves in the frequency range 380 to 470 MHz or -800 MHz. Under certain circumstances, these radio waves could be harmful to any living being or electronic equipment near it. Care should be taken to ensure that the radio and antenna systems are installed and commissioned only by trained persons.

This radio equipment should not be used in life support systems or in safety systems without our prior written permission.

## 1.3 Disclaimer

We have carefully checked the contents of this document, and the hardware and software described in it, for compatibility. We cannot however exclude possibilities of deviations and cannot guarantee complete conformity of the document with the equipment it describes. If any corrections or improvements are to be made, they will be taken into consideration in the next edition of this document.

Important instructions are marked by the expressions "Important", "Note" or "Caution!". These should be carefully observed. Explanations regarding these precautions can be found in the website [www.TetraModem.com](http://www.TetraModem.com), in the Login Area pages.

## 1.4 General description

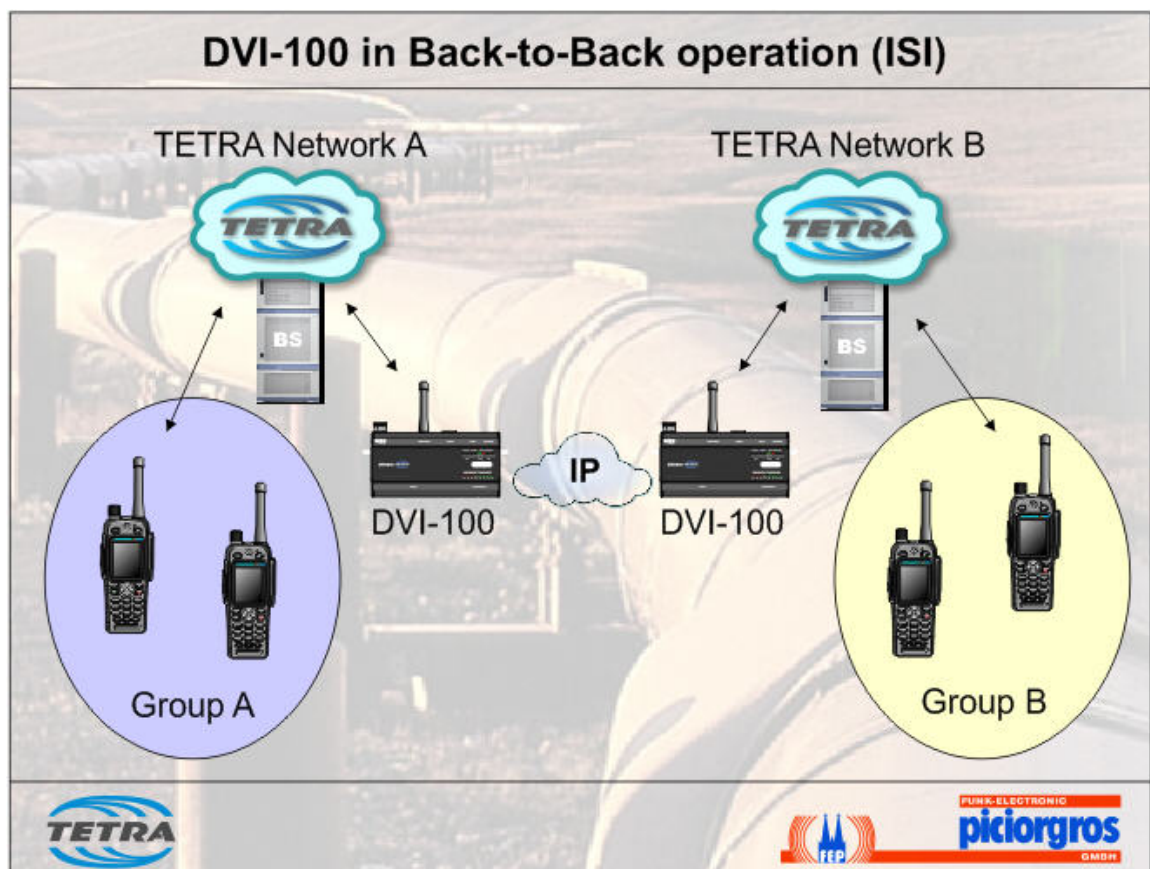
The DVI-100 (Digital Voice Interface) will be attached to a TETRA Network in the same way as a normal TETRA hand portable, and it can be a Member of up to 25 talkgroups. When it receives a voice call, rather than decoding the digitally coded ACELP data stream into analogue audio and feeding it to the Loudspeaker, it is sent as a digital (UDP) data stream to its IP port. Connecting two DVI-100s back-to-back with each device connected to a different TETRA network (which could be different infrastructure manufacturer, different frequency bands or geographically separated), allows the networks to be “interconnected” based on group calls, status messages, and short data messages. As the voice data stream is not converted back into an analogue signal at any time, the voice quality has the same brilliant quality as received with a TETRA hand portable.

The DVI-100 can be used in each of the three following described scenarios.

## 1.5 Application scenarios

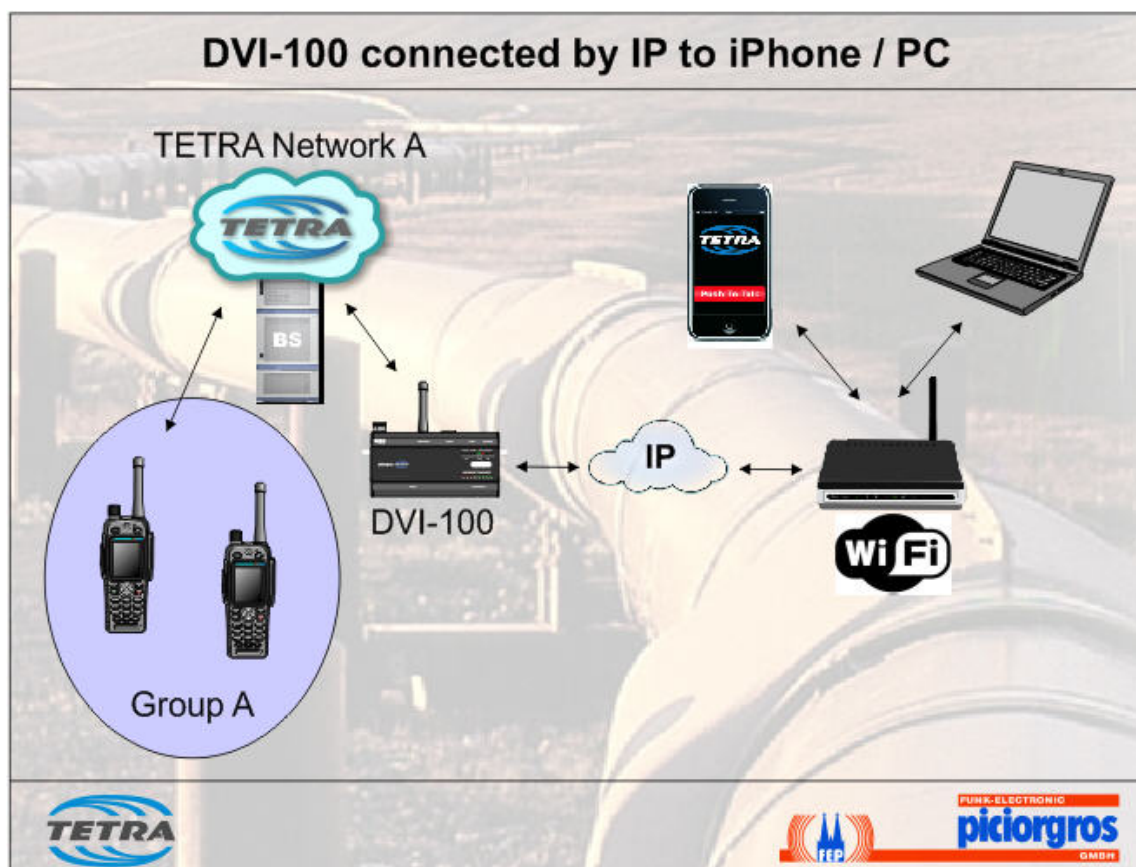
### 1.5.1 Back to Back Operation

With two DVI-100's logged into different TETRA networks and by connecting them via Back-to-Back IP, an easy ISI for voice and SDS transmission can be implemented.



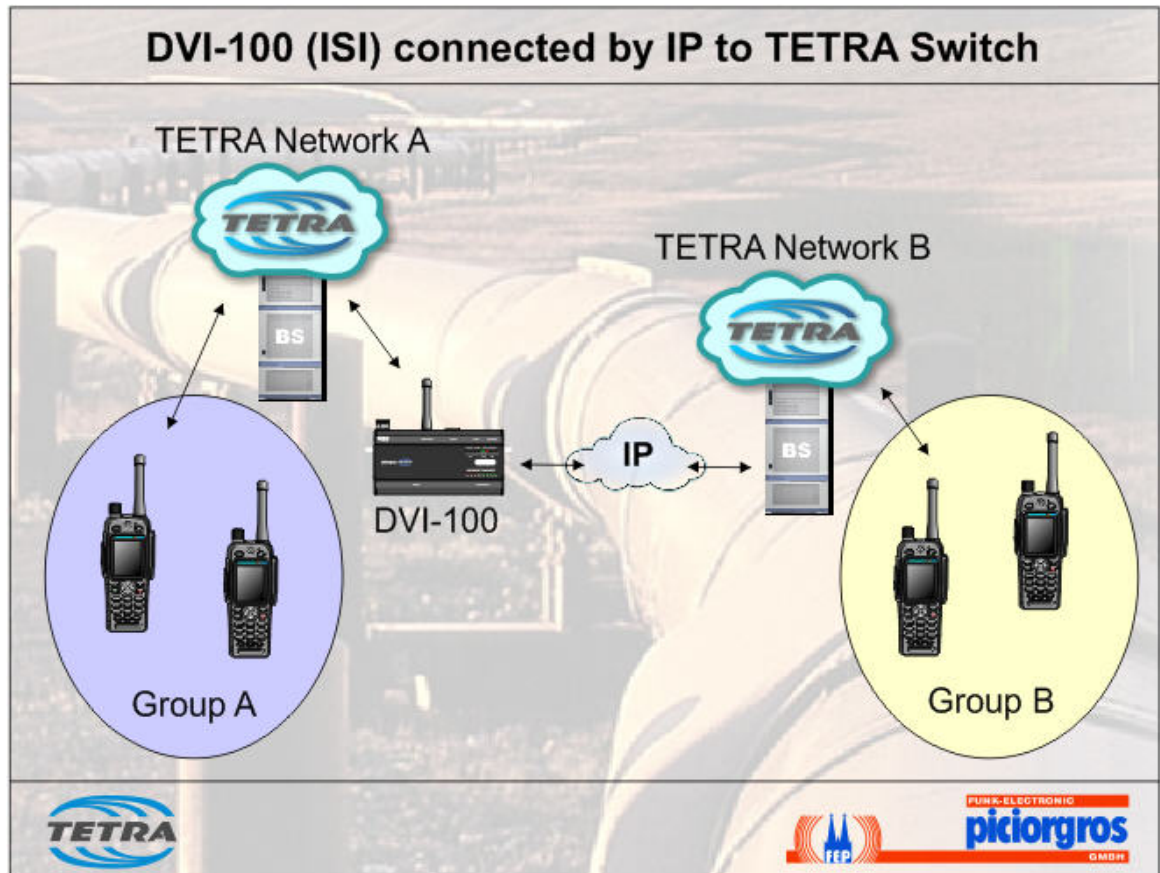
### 1.5.2 Connected to the iPhone or a Computer

Using the DVI with IP, the voice data can easily be sent to, or received by, a remote application, potentially running on any type of device. This allows the voice call to be bridged between the TETRA infrastructure and another device. An iPhone application is available, as well as Java based software for Mac or Windows Computers. This application can be useful, if a user needs to talk or just listen to a group within a TETRA network, even when they are out of coverage of the TETRA network.



### 1.5.3 Connected by IP directly to a TETRA switch

The PTX Protocol developed by the University of Dortmund and Piciorgros GmbH is license free and can be implemented to an interface device (PC) or directly into a TETRA switch. So an Inter System Interface (ISI) for voice and data based on groups can easy be implemented.



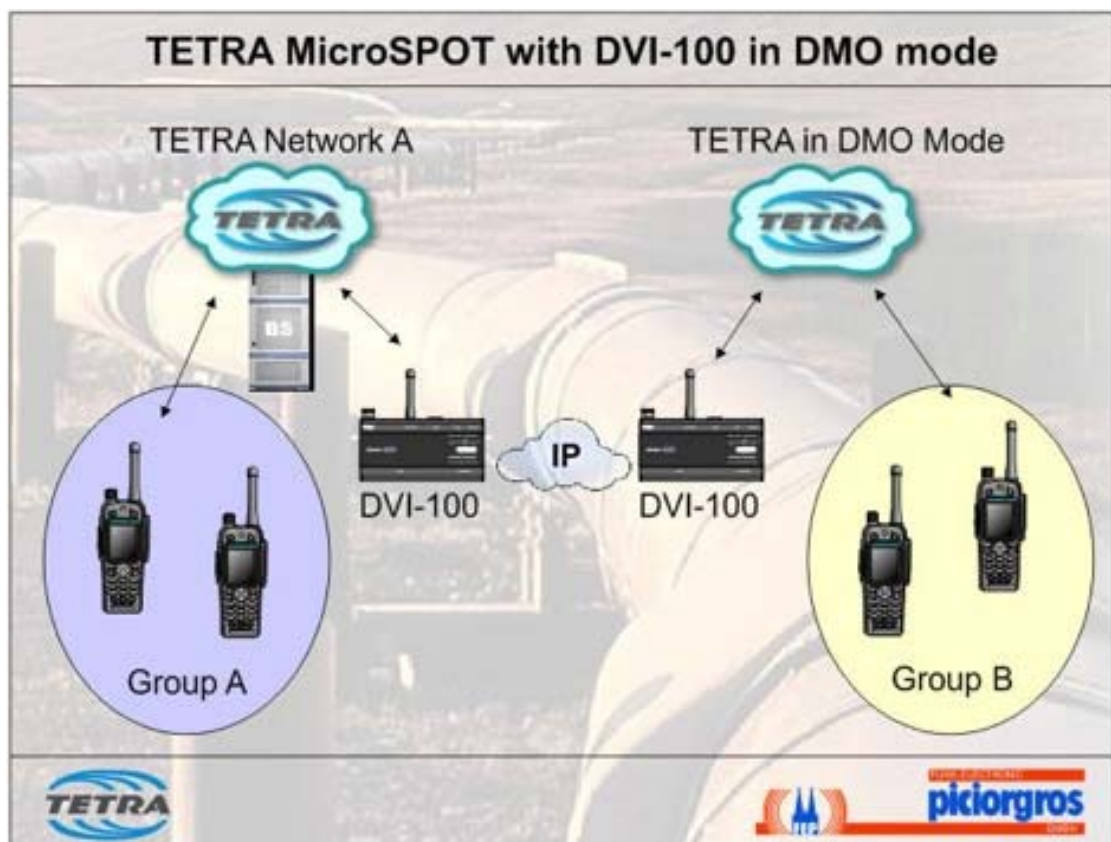


#### 1.5.4 TETRA MicroSPOT with DVI-100 in DMO mode

This configuration can be used to create a local TETRA access point (MicoSPOT) which operates in DMO mode. The DVI-100 in DMO mode is connected by an IP connection to another DVI-100 in server mode, which is attached to a TETRA network.

All TETRA terminals in DMO mode and in range of the DVI-100 MicroSPOT can access the configured group(s) of the trunked TETRA network by using voice, SDS and status communication.

Sample applications for the MicoSPOT can be improving inhouse coverage or covering white spots inside a TETRA network. By using a reliable mobile IP link (3G or LTE) mobile forces can use the TETRA network even in uncovered areas.



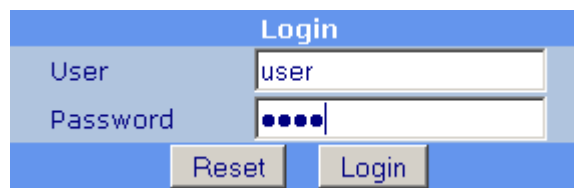


## 2 Access the embedded Web server

The whole configuration is done by accessing the internal web server of the DVI-100 and changing certain parameters using the user-friendly interface. The first to do is to integrate the device into the local network. The network is supposed to use addresses of the type 192.168.0.xxx.

The DVI-100 itself is available at the address 192.168.0.199. It must be sure that the network has the right range of addresses and there is no other device with this address connected to the network.

Accessing the interface the first time, a username and a password are required. The login is registered to the name 'user' and the password 'user'. The password can be changed as one of the following steps.



Login	
User	<input type="text" value="user"/>
Password	<input type="password" value="•••••"/>
<input type="button" value="Reset"/> <input type="button" value="Login"/>	

In registered state the user can see a menu on the left hand side, a content window on the right and a footer containing selected information on the bottom.



DVI-100 configuration panel	
Funk-Electronic Piciorgros GmbH	
Login: user	<input type="button" value="Logout"/>
<b>Device</b>	<b>Contact information</b>
Common	Company Funk-Electronic Piciorgros GmbH
Internal clock	Address Claudiastraße 5
DVI	51149 Cologne
TETRA	Germany
Ethernet	Phone +49 2203 911 770
Service	Fax +49 2203 913 006
	Internet <a href="http://www.piciorgros.com">http://www.piciorgros.com</a>
	E-Mail <a href="mailto:info@piciorgros.com">info@piciorgros.com</a>
SN: 4720   ETH-IP: 192.168.0.191   TETRA-IP: 0.0.0.0   ISSI: 100   FREQ: 0.000000 MHz   FS: -0 dBm	
<a href="#">Refresh footer information</a>	

## 3 Register the DVI-100 to the TETRA Network

In factory default state there is no information available for the device to enter the TETRA network. This is why the TETRA parameters have to be configured before the device is able to register on the network.

### 3.1 Basic TETRA parameters

The TETRA parameters configuration can be accessed in "TETRA >> Parameters"

First, the operation mode must be selected between TMO mode and DMO mode. The TMO mode (trunked mode) is used when the DVI-100 should be attached to an existing TETRA infrastructure while the DMO mode (direct mode) should be used to create a local MicroSPOT in areas without TETRA coverage.

In both modes, the basic parameters are the ISSI, the MCC and the MNC. The MCC and MNC must match the corresponding values of the TETRA infrastructure (TMO mode) or the TETRA terminals which needs to communicate with the DVI-100 (DMO mode). The ISSI must be a unique subscriber number which must be configured in the TETRA infrastructure in TMO mode.

TETRA parameters	
TETRA mode	<input checked="" type="radio"/> TMO <input type="radio"/> DMO
ISSI	<input type="text" value="1234"/>
MCC	<input type="text" value="262"/>
MNC	<input type="text" value="1"/>

## 3.2 TMO mode parameters

If the TMO mode is configured, at least one scan range for the lookup of base stations of the TETRA network must be configured. Here, the value of the first (lowest) scan frequency must be inserted. Alternatively if no frequency information is available, a TETRA “Channel” can be selected at “Select input” and the number of the first channel can be inserted in combination with the networks offset value. The range of scanned channels can be varied up to a maximum value of 400.

Frequency setting 1	
Select input	<input checked="" type="radio"/> Frequency <input type="radio"/> Channel
Frequency	<input type="text" value="425.050000"/> [MHz]
	-or-
Channel	<input type="text" value="1002"/>
Offset	<input checked="" type="radio"/> No <input type="radio"/> 12.5 kHz <input type="radio"/> -6.25 kHz <input type="radio"/> +6.25 kHz
Scan range	<input type="text" value="198"/> [channels]

To apply the changes the button “Apply” has to be pushed. Following a button appears underneath to restart the device. After the restart the device reprograms the internal TETRA modem with the new parameters. This can be seen when the numbered LEDs in the RF display are toggled from the right to the left.

Next the modem starts to log in the network. The RF display runs from the right to the left again. This means that it is essential to observe the LED movement at least twice before the device is registered in the network using the new parameters.

When registered the RF display shows the field strength of the device. Otherwise it starts consecutive tries to access the network.

### 3.3 Configure the available TETRA groups

The DVI-100 manages up to 25 TETRA groups. Each group must be configured in the infrastructure. The DVI-100 can register to these groups and they have to be programmed at "TETRA >> Group configuration".

To configure the "selected" group, the corresponding number must be written to the upper input field. All other groups are "scanned".

In DMO mode, each group includes also a frequency input field. As there will be no scanned groups in DMO mode, only the selected group is active in this case, using the configured frequency. A change between DMO groups (and frequencies) can be achieved by changing the selected group of the DVI-100.

TETRA group configuration	
Number of selected group	1
<hr/>	
Group 1 name	Police Forces
GSSI	100
DMO Frequency	400.000000 [MHz]
Enabled	<input type="radio"/> No <input checked="" type="radio"/> Yes
Group mode:	Selected
Group 2 name	Firefighters
GSSI	101
DMO Frequency	400.100000 [MHz]
Enabled	<input type="radio"/> No <input checked="" type="radio"/> Yes
Group mode:	Scanned

#### Group X name

This is the name of the group. It is an additional information which is transmitted to the clients to display group names. It has no effect to the TETRA network.

#### GSSI

The Group Short Subscriber Identity (GSSI) is the identifier of the TETRA group.

#### DMO Frequency (DMO mode only)

This field is only visible in DMO mode and defines the frequency on which the DVI-100 is operating for any given groups. In DMO mode, there are no scanned groups and the DVI-100 will only operate on the selected group. With changing the selected group, also the frequency will be changed according to the configuration of this page.

**Enabled**

Only enabled groups are registered towards the TETRA network. This feature can be used to temporarily prevent a group from being registered in the TETRA network without removing it completely from the DVI-100 configuration.

**Group mode**

Scanned groups are participants of the communication. The selected group is the main talkgroup for a TETRA subscriber.

If no defined call destination is given to the DVI-100 by a connected client, any outgoing calls are made to the selected group by default. In addition to the selected group, voice calls, SDS and status messages of all scanned groups will be received by the DVI-100 in TMO mode.

In DMO mode, there are no scanned groups – and only the selected group will be the one and only group calls and messages can be received from.

## 4 General Setup

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### 4.1 Read general DVI-100 information and change the designation

To get general information about the device on hand the menu item “Device >> Common” can be selected. The delivered data contains detailed information about the device and version numbers.

Device information	
Serial Number	4720
Software Version	1.00
Build:	1941* Beta (Feb 1 2012, 15:13:54)
Hardware Version	2
Type Designation	<input type="text" value="FEP Dev Test2"/>

The field “Type designation” represents the designation of the DVI. This text can be used in messages to identify the device.

## 4.2 Adjust the internal clock

The internal clock can be adjusted manually at “Device >> Internal clock”. Here the date can be entered as “dd/mm/yyyy” and the time information as “hh/mm/ss”. To apply the inserted time, the user has to set the option “Set clock” to “Yes” and press the “Apply” button.

Optionally the DST control can be switched off is needed.

As soon as a valid IP address is inserted for the SNTP server, the DVI connects the server to fetch time information on its own. Furthermore the interval of connecting the SNTP server and the offset of the local time in relation to the delivered time can be adjusted.

Internal clock	
Date	2 . 2 . 2012 (Thursday)
Internal time	10 : 9 : 43 (winter)
Set clock	<input type="radio"/> No <input checked="" type="radio"/> Yes
Timeset options	
DST control	<input checked="" type="radio"/> On <input type="radio"/> Off
SNTP server IP	192 . 53 . 103 . 108
<i>If GPS is active, GPS will be used instead of SNTP server.</i>	
Update interval	10 [min] (0 .. 1440)
Timezone offset	1 [h] (-24 .. 24)
30 min offset	<input checked="" type="radio"/> no <input type="radio"/> +/- 0.5 h
Timeserver options	
Destination SSI	0
	<input checked="" type="radio"/> Individual <input type="radio"/> Group
Transmission interval	0 [min]
<input type="button" value="Reset"/> <input type="button" value="Apply"/>	

The DVI can be used as timeserver for TETRA devices. Therefore the SSI of the target group or individual Piciorgros device has to be entered as “Destination SSI” at the timeserver section. The interval defines how often the time information is sent.



### 4.3 Change the DVI-100 network setting

The menu item “Ethernet >> Network” links to the configuration page for the Ethernet interface.

Here the IP address of the DVI-100 as well as the netmask and the gateway information can be defined. It is recommended to change the Ethernet parameters according to the needs of the installation.

Local IP Network Settings				
IP address	192	168	0	199
Netmask	255	255	255	0
Gateway	192	168	0	1

The configuration has to be saved by pressing the Apply button. Afterwards the device has to be restarted. This can be done remotely by using the appearing orange bar which contains the restart button. For the next login the target IP address in the browser must be adjusted.

### 4.4 Change the web servers passwords

The own password can be changed at „Service >> Manage passwords“. To validate a new password, the code must be entered in both designated fields.

Manage passwords	
Change own password	
New Password	●●●●●●
Repetition	●●●●●●

The password becomes valid immediately. To reset it to the default it can either be changed back manually or the Reset-to-Factory-Default operation resets the whole setting of the DVI including the passwords.

## 4.5 The Eventlogger

The eventlogger stores information about the behaviour of the DVI-100. Special events are able to trigger messages which allow the user to detect e.g. configuration problems. The logger can be accessed at „Service >> eventlogger“.

```
Event logger
24.01.12 11:52:07 ***Device started with SW-Version: 02.08***
24.01.12 11:52:07 Restart cause: 00010400
24.01.12 11:52:07 Internal extension board found.
24.01.12 11:52:07 I/O-Board found with SW-Version: 01.33.
24.01.12 11:52:07 Displayboard found with SW-Version: 01.34.
24.01.12 11:52:07 Device was 0 days, 0 hours, 0 minutes and 24 seconds down!
```

## 5 DVI-100: Client mode

### 5.1 Activation of the client mode

To define the DVI-100 device to work as client, the configuration site at “DVI >> General configuration” contains the relevant settings.

The option “DVI-100 mode” is the main selection and has to be set to “Client”.

Digital Voice Configuration	
DVI-100 mode	<input checked="" type="radio"/> Client <input type="radio"/> Server
Own DV IP Port	<input type="text" value="3141"/>
<hr/>	
Default Call	<input type="text" value="0"/>
	<input type="radio"/> Individual SSI <input checked="" type="radio"/> Selected Group
Alive message interval	<input type="text" value="10"/> (5-99 s)
<hr/>	
Monitoring IP address	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>
Monitoring IP Port	<input type="text" value="0"/>
<input type="button" value="Reset"/> <input type="button" value="Apply"/>	

#### Own DV IP Port

Sending and listening port at the Ethernet interface of the DVI-100 (Default is port 3141).

#### Default Call SSI

Messages received on the Ethernet interface which have no explicit target information are directed to this target in the TETRA network. This is, by default, the current selected group. The destination can be also any individual device. In a back-to-back configuration this is also the target where all calls and messages will go to.

#### Alive message interval

The client cyclically sends an alive-message to the server via the Ethernet interface. The time span of this interval can be defined in the range of 5 to 99 seconds. If the server does not respond, the client tries periodically to reconnect to the DVI server.

#### Monitoring

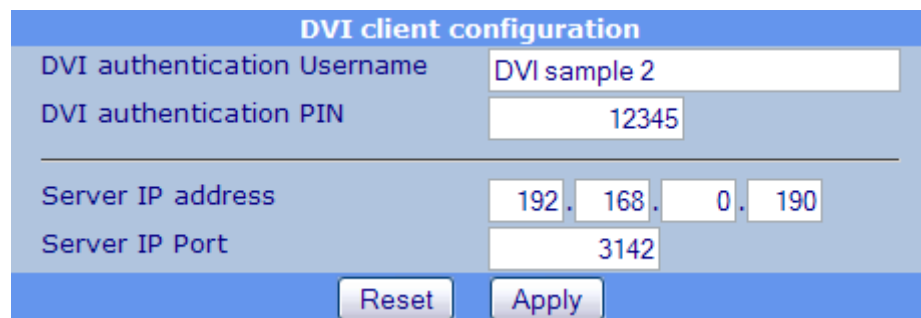
The monitoring functionality needs to have an IP address and port information. While operating the DVI spreads all incoming voice and message data also to the configured monitoring target in the Ethernet network.

## 5.2 Configure the connection parameters

Each client can be identified with the combination of username and password. At the site “DVI >> Client configuration” these information can be edited for the device in hand.

Regarding the following screenshot the users’ information (username and password) can be configured in the upper two fields.

The username / PIN combination must be configured in the DVI-100 server to authenticate the clients. Without a matching username / PIN combination, the server will not accept any connection attempts from a client.

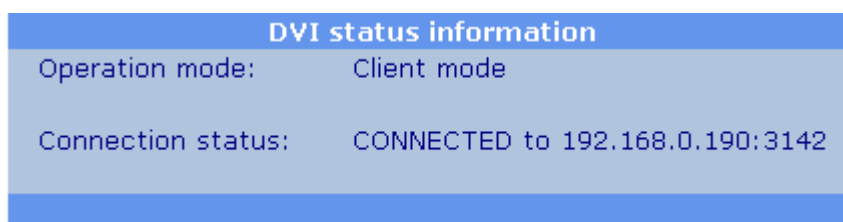


DVI client configuration	
DVI authentication Username	DVI sample 2
DVI authentication PIN	12345
Server IP address	192 . 168 . 0 . 190
Server IP Port	3142
<input type="button" value="Reset"/> <input type="button" value="Apply"/>	

To make the client familiar with the responsible communication server, this data has to be inserted in the next fields. The “Server IP address” must be programmed as the IP address of the servers Ethernet port. Similarly the number of the port has to equal the listening port of the server.

## 5.3 View the connection status

To get the information about the current connection status to the server, the user can select the menu item “DVI >> Status information”.



DVI status information	
Operation mode:	Client mode
Connection status:	CONNECTED to 192.168.0.190:3142

## 6 DVI-100: Server mode

### 6.1 Activation of the server mode

To define the DVI-100 device to work as server, the configuration site at “DVI >> General configuration” contains the relevant settings.

The option “DVI-100 mode” is the main selection and has to be set to “Server”.

Digital Voice Configuration	
DVI-100 mode	<input type="radio"/> Client <input checked="" type="radio"/> Server
Own DV IP Port	<input type="text" value="3141"/>
<hr/>	
Default Call	<input type="text" value="0"/>
	<input type="radio"/> Individual SSI <input checked="" type="radio"/> Selected Group
Alive message interval	<input type="text" value="10"/> (5-99 s)
<hr/>	
Monitoring IP address	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>
Monitoring IP Port	<input type="text" value="0"/>
<input type="button" value="Reset"/> <input type="button" value="Apply"/>	

#### Own DV IP Port

Sending and listening port at the Ethernet interface of the DVI-100 (Default is port 3141).

#### Default Call SSI

Messages received on the Ethernet interface which have no explicit target information are directed to this target in the TETRA network. This is, by default, the current selected group. The destination can be also any individual device. In a back-to-back configuration this is also the target where all calls and messages will go to.

#### Alive message interval

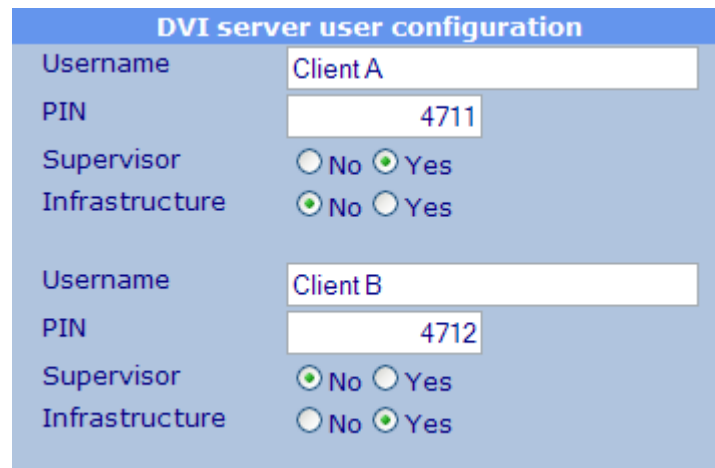
The server cyclically sends an alive-message to each client via the Ethernet interface. The time span of this interval can be defined in the range of 5 to 99 seconds. If a client does not respond, the server will tag this client as "disconnected".

#### Monitoring

The monitoring functionality needs to have an IP address and port information. While operating the DVI spreads all incoming voice and message data also to the configured monitoring target in the Ethernet network.

## 6.2 Manage the client list

As soon as the DVI-100 is installed to work as server, the device has to be programmed with the account information of the potential clients. The site “DVI >> Server configuration” offers a list consisting of ten input collections for the client data.



The screenshot displays the 'DVI server user configuration' interface. It features two distinct sections for configuring client accounts. Each section includes a 'Username' text input field, a 'PIN' text input field, and two radio button options for 'Supervisor' and 'Infrastructure'. The first client, 'Client A', has a PIN of 4711 and is configured as a Supervisor (Yes) and Infrastructure (No). The second client, 'Client B', has a PIN of 4712 and is configured as a Supervisor (No) and Infrastructure (Yes).

DVI server user configuration	
Username	Client A
PIN	4711
Supervisor	<input type="radio"/> No <input checked="" type="radio"/> Yes
Infrastructure	<input checked="" type="radio"/> No <input type="radio"/> Yes
Username	Client B
PIN	4712
Supervisor	<input checked="" type="radio"/> No <input type="radio"/> Yes
Infrastructure	<input type="radio"/> No <input checked="" type="radio"/> Yes

### Username

The username is the name of the client which is transmitted during the registration process.

### PIN

The PIN is the four digit long security number which is transmitted during the registration process.

### Supervisor

A client who is configured as supervisor is able to change the "selected" TETRA group of the server DVI.

### Infrastructure

A client who is confirmed as infrastructure will not be served with information messages from the server. These messages include client or group status information as this data is mainly used to display this information on the GUI of a client.

### 6.3 View the connection status

To get the information about the participants which are currently connected the user can select the menu item “DVI >> Status information”.

Here the operating mode is shown. In case that the current device is a server, the following picture declares the operating mode as “Server mode”.

DVI status information	
Operation mode:	Server mode
Connected clients	
192.168.0.119:3141	ClientA
192.168.0.12:3141	ClientB

The section “Connected clients” contains a list of all currently connected clients. Each client is represents one row. The information includes the clients IP address and their used port number as well as the clients’ designation.



## 7 DVI-100 Firmware update procedure

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The firmware of the DVI-100 can be easily updated. To perform the update, just a TFTP client is needed. A simple command-line client is built directly into Windows operating system.

### 7.1 Preparation and setup

For updating the DVI-100 you will need the following equipment:

- PC with Ethernet connection
- TFTP client software (Windows command line or i.e. "PumpKIN" software)
- Firmware files for the DVI-100

### 7.2 Update procedure

For the update, two firmware files are needed. The file with the extension ".pfw" is the firmware file, the one with the extension ".pch" is the keyfile to activate the loaded firmware.

To perform the update, the ".pfw" file must be sent first to the DVI-100. Unless the ".pch" file is sent to the DVI-100, the device will just store the new firmware file.

As soon as the matching ".pch" file is also transferred to the DVI-100, the device will restart and reprogram itself to the new firmware.

#### **Important!**

This reprogramming after sending the ".pch"-file to the device will take about 15-20 seconds. During this action, **DO NOT INTERRUPT THE POWER TO THE DVI-100**. Otherwise the update fails and the device must be restored by a Piciorgros partner.



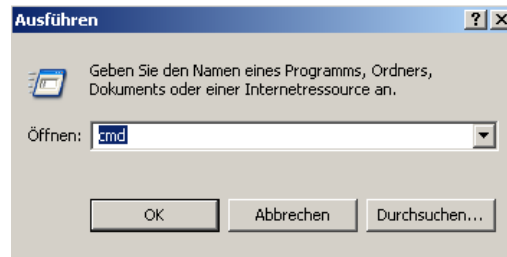
After the update process has ended, the device will start immediately with the new firmware.

### 7.3 Connecting the DVI-100

Connect the Ethernet port of the DVI-100 to the PC. The IP-settings of the PC must allow it to access the DVI-100 (default IP: 192.168.0.199).

### 7.4 Update using the Windows command line client

Start the Windows command line by using "Start" / "Execute" and then type "cmd"



Change to the directory where you've put the firmware files

```
C:\WINDOWS\system32\cmd.exe
C:\>cd c:\DVI-100
C:\DVI-100>dir
Volume in Laufwerk C: hat keine Bezeichnung.
Volumeseriennummer: BC5A-6116

Verzeichnis von C:\DVI-100

02.02.2012  16:22    <DIR>          .
02.02.2012  16:22    <DIR>          ..
07.11.2011  10:12             14 DVI-100_V0101.pch
07.11.2011  10:50          413.504 DVI-100_V0101.pfw
                2 Datei(en)    413.518 Bytes
                2 Verzeichnis(se), 112.053.198.848 Bytes frei

C:\DVI-100>
```

Transfer the .pfw file to the device, using the command

```
tftp -i 192.168.0.199 PUT filename.pfw
```

The IP here is the default IP of the DVI-100, if this IP is changed you have to give the correct IP address instead. Also "filename.pfw" must be replaced by the real firmware file name.

The transfer will take some seconds; unfortunately the software won't give you any feedback of the progress. After some seconds you should see the success output like this:

```
C:\DVI-100>tftp -i 192.168.0.199 PUT DVI-100_V0101.pfw
Übertragung erfolgreich: 304856 Bytes in 7 Sekunden, 43550 Bytes/s
C:\DVI-100>
```

Now you'll perform the same action again, but now for the ".pch" file.

```
C:\DVI-100>tftp -i 192.168.0.199 PUT DVI-100_U0101.pch
Übertragung erfolgreich: 14 Bytes in 1 Sekunden, 14 Bytes/s
C:\DVI-100>
```

The device should restart now, doing the internal update process.

### **Important!**

Do not disconnect the DVI-100 from its power until the update process has finished (the DVI will not show any action on its LED for about 15-20 seconds, then it will restart). After the DVI has restarted and is alive, the power can be disconnected.



The .pch file must always match to the corresponding firmware. Otherwise an error message will be displayed and the update operation will not be started:

```
C:\DVI-100>tftp -i 192.168.0.199 PUT DVI-100_U0101.pch
Fehler auf Server : .pch file does not match firmware or wrong device type
C:\DVI-100>
```